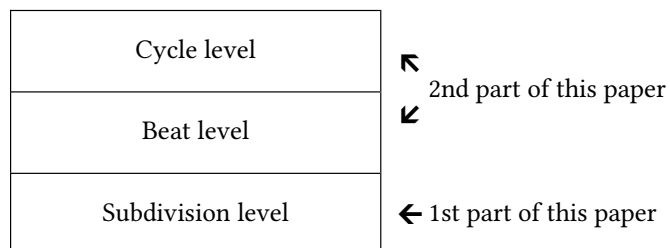Gérald Guillot

Multi-level Anisochrony in Afro-Brazilian music

1. Introduction

The temporal organization of Afro-Brazilian music is the object of an increasing number of academic works, which deal with two distinct phenomena: the organization of subdivisions [1] and their grouping in identifiable rhythmic structures. The first part of this paper will present some results from my own empirical research about anisochrony (or non-isochrony) at the level of pulse subdivisions. [2] The second part of the paper is far more speculative; based on new hypotheses, it lays the basis for future works on beat anisochrony (see Example 1).

Cycle level	↖
	2nd part of this paper
Beat level	↙
Subdivision level	← 1st part of this paper

Methodologically, this study might be thought of as a hybrid: on the one hand, it uses data coming from ethnomusicological field investigations and audio-recording processing; on the other hand, it tries to rise to a high level of abstraction, adopting the perspective of systematic musicology. Due to space limitations, this paper can only provide a broad outline of its various topics.

2. Corpus

This paper focuses on Afro-Brazilian music. But, to what extent can a piece of music be considered to be Afro-Brazilian? Defining the limits of such a corpus

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1 In the literature, other terms can be found, like basic pulses, fast pulses, sub-pulses, tatums, minimal operational values, density referent, etc.

2 Guillot 2011.

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seems easy at first. In reality, it could be a very hard task. One might begin by proposing that Afro-Brazilian music is played by Afro-Brazilian people. But the problem is actually more complicated. Studies about African descendants in Brazil show that this concept is more linked to identity than genetically constructed. Moreover, a growing number of white middle-class people play in percussion groups, hugely inspired by Afro-Brazilian drumming traditions. Afro-Brazilian music can be considered as ›neo-African‹ music in Brazil.[3] A second way of identifying music as Afro-Brazilian, proposed in an earlier paper,[4] is based on the hypothesis that all Afro-Brazilian music, beyond all possible hybridization processes, shares some common musical characteristics that allow one to define the limits of the corpus. This hypothesis is only an extension of previous research, mainly by Jeff Pressing, Kazadi wa Mukuna, and Gerhard Kubik.[5]

Despite an important ethnic mixing among the populations (native Indians, slaves, settlers), the analysis of Afro-Brazilian music reveals the presence of musical paradigms, called ›characteristic devices‹ by Pressing,[6] similar to those observed in much sub-Saharan music, in particular from West Africa.[7] Some common characteristics are clearly so salient in the Americas (mainly the Caribbean area and northern Brazil) that some authors speak about ›Black-Atlantic rhythm‹[8] or ›black Atlantic musical systems of drums‹[9].

Kubik is convinced that these musical characteristics, and especially time-line patterns, must have been a rather stable element in African music history. […] They were present in West Africa in the 16th century and much, much earlier. The presence or absence of one of the African time-line patterns in Afro-American music can, therefore, be considered *diagnostic* for historical connections with specific African cultures. In the study of Afro-Brazilian (and indeed other Afro-American music) with non-historical methods it may be rewarding even to start one's investigation by first checking their presence in the musical samples at hand.[10]

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3 Fryer 2000, p. 9.

4 Guillot 2015.

5 Pressing 2002; Mukuna 1979; Kubik 1979.

6 Pressing 2002, p. 185.

7 Wilson 1974.

8 Pressing 2002, p. 285.

9 Ferreira 2004, p. 877.

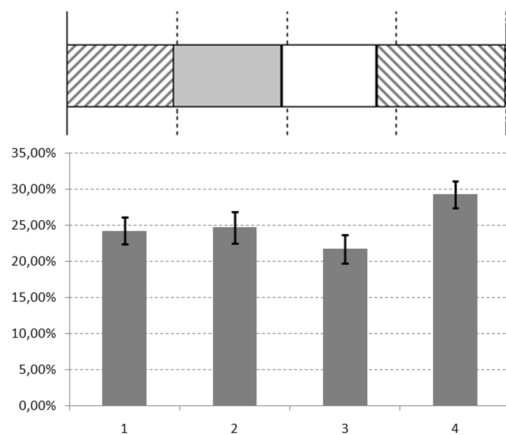10 Kubik 1979, pp. 18–19. Italics in original text.

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In the following discussion, I will refer to recordings coming from several (very different) musical traditions: *samba*, *maracatu de baque virado*, *tambor de crioula*, *embolada* and *carimbo*.

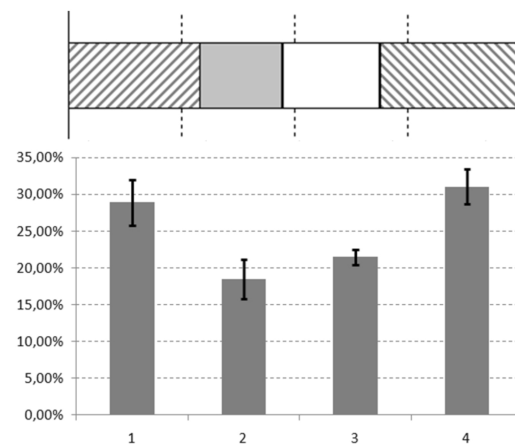Multi-level Anisochrony in Afro-Brazilian music

3. Subdivision-level anisochrony (microtiming)

The use of the expression ›microrhythmic anisochrony‹ roughly parallels the notion of ›metric anisochrony‹.[11] The type of anisochrony on which I have been working is known in the literature as ›microtiming‹. Confirming the results of similar studies,[12] all Afro-Brazilian musical organizations on which I have done measurements show a stabilized anisochrony of the basic pulses. Most important is the fact that I have never found any counterexample of an Afro-Brazilian piece of music in which the subdivisions are (clearly and intentionally) isochronous.

Examples 2 and 3[13] refer to two very distinct Afro-Brazilian musical traditions from a synchronic point of view. Similar kinds of data from other studies[14] reveal a considerable variety in the characteristics of Afro-Brazilian rhythmical organization.

Example 2: *Casa Barata* (*carimbo*) – 2005
Grupo Quixabeira

Example 3: *Baiei na Bahia* (*tambor de crioula*) – 2005
Unidos de São Benedito de Eliésio

11 In reality, all music is intrinsically rhythmic: music needs time to be segmented, whatever parameter of sound one chooses. Of course, sometimes this rhythm is not perceptible by human cognition, as is the case with John Cage's *Organ2/ASLSP* (1987).
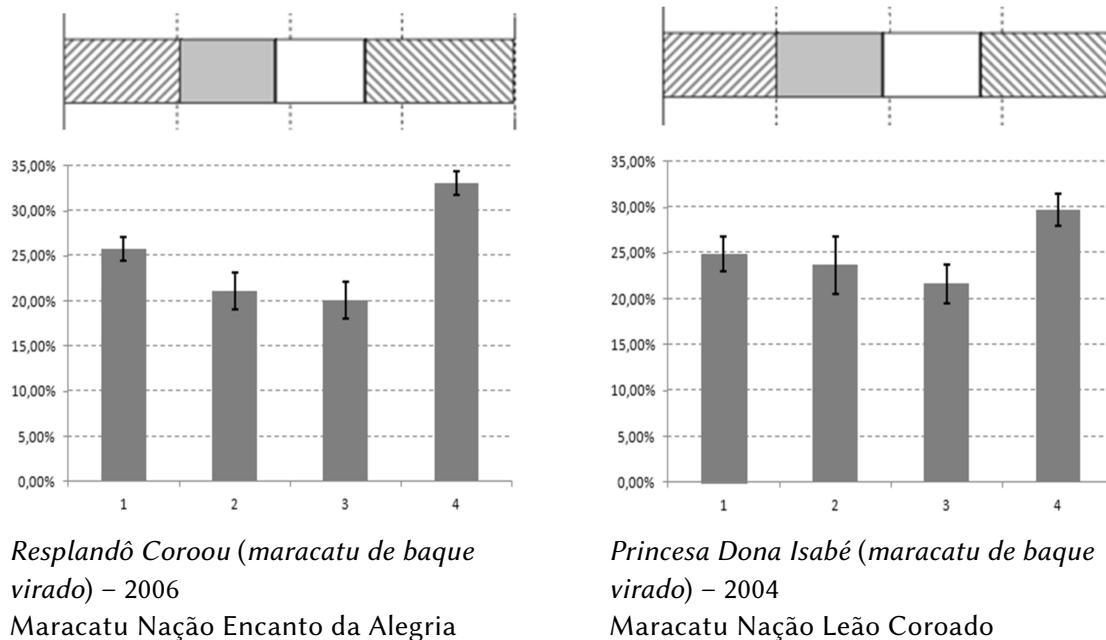
12 For instance, Lucas 1999; Gerischer 2006; Gouyon 2007.

13 The data (which are average values) were obtained with Sonic Analyzer and a plug-in of onsets detection. The figures show two juxtaposed representations of microtiming values of each of the four subdivisions. The upper diagram is a kind of proportional score of the measured means (the time flows from left to right, the dashed lines dividing the beat into four equal durations). The lower diagram shows the means (gray blocks) and variances (black lines) of the same four subdivisions. The upper diagram is more intuitive, or ›musical‹; the lower one is quantitatively more precise. Source: Guillot 2011.

14 Lucas 1999; Batista 2002; Lindsay et al. 2006; Naveda et al. 2011; Gouyon 2007; Gerisher 2006; Haugen et al. 2014.

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Although it is plausible, but not certain, that a given music style adopts a specific microtiming profile, variability still exists among local communities. Example 4 shows examples of *maracatu de baque virado* (Pernambuco), taken from two communities separated by only four kilometers.

Resplandô Coroou (maracatu de baque virado) – 2006
Maracatu Nação Encanto da Alegria

Princesa Dona Isabé (maracatu de baque virado) – 2004
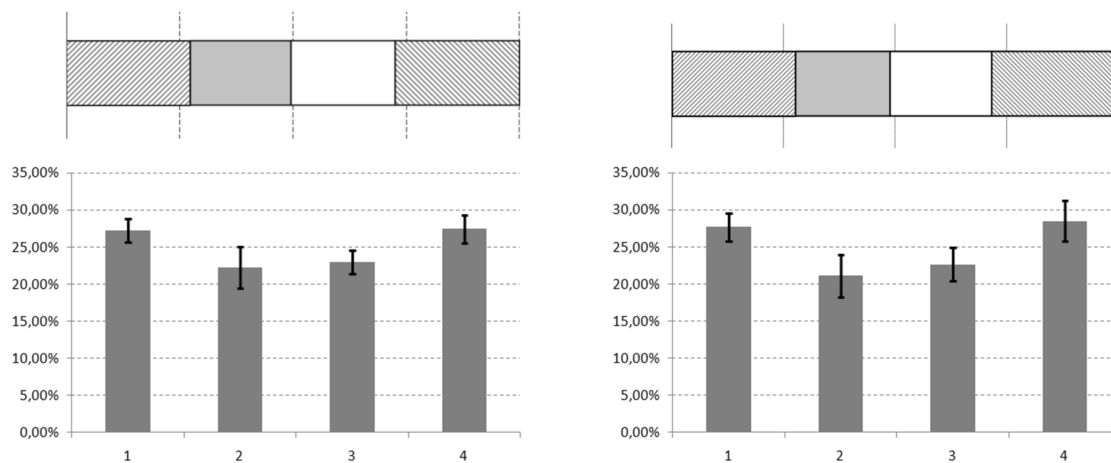Maracatu Nação Leão Coroado

Example 4: A comparison of microtiming data coming from two groups of *maracatu de baque virado* (Pernambuco)

At last, although old audio recordings are rare, it must be noted that the particular patterns of microtiming found today were already present at the beginning of the 20th century. Example 5 shows two examples; the first one is considered to be the first *samba*,[15] written in 1916 for the 1917 carnival. The second is an *embolada*, a musical piece from the northeastern part of Brazil, played in 1938. Two important features must be pointed out. First, upon a first listening, neither of these recordings sound ›afro‹, especially because of the instrumentation. Second, although these pieces of music were recorded twenty-two years apart and pertain to distinct musical styles, they reveal very similar profiles. It is not clear why this would be the case; it may in fact be a coincidence.

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15 From a metrical point of view, it sounds more like a *maxixe*. This was the main criticism formulated when it was broadcast in 1917.

Pelo telefone (*samba*) − 1916
Ernesto »Donga« dos Santos – Mauro de Almeida

Para onde vai valente (*embolada*) − 1938
Manezinho Araújo – Grupo da Odeon

Example 5: Two examples showing the existence of microtiming in early recordings of Brazilian music

4. Beat-level anisochrony

4.1 Time-line pattern / non-isochronous meter

Several Afro-Brazilian musical styles show, each one in a singular way, what N'Ketia calls a time-line pattern, which he defines as »a constant point of reference by which the phrase structure of a song as well as the linear metrical organization of phrases are guided.«[16] Speaking about a Ghanaian war dance, David Locke declares that »every act of drumming, singing, and dancing is timed in accordance with the recurring musical phrase played on an iron bell.«[17] A similar principle seems to be present in much, perhaps all, Afro-Brazilian music and dance traditions. Carlos Sandroni made the very first extensive study on this topic concerning the *samba* in Rio de Janeiro.[18]

In the Afro-Brazilian *candomblé*, the *loas* (praises) are learned during the ceremony by simultaneously playing the time-line pattern on the bell (called *gã*

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16 N'Ketia 1963, p. 78.
17 Locke 1984, p. 114.
18 Sandroni 1997.

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or *agogô*)[19]. In Example 6, the canticle »*Oba nixá*« is transcribed with the *agogô* bell.

Example 6: First notes of the transcription of *Oba nixá – candomblé*[20]

Fonseca states that the *agogô* part is a ›*camada básica*‹ (basic layer) which has »the function of making the density referent – the *timeline* –, the guideline, explicit.«[21] A similar function would be characteristic of Afro-Diasporic music[22] and shows mathematical properties[23]. I shall consider this time-line pattern as a ›non-isochronous meter‹,[24] although I prefer the strictly equivalent terminology ›anisochronous meter‹.

Influenced by my twenty-five years of experience playing and teaching Afro-Brazilian music, I put forth the hypothesis that Afro-Brazilian time-line patterns fall into two basic types. The first type is *explicit*, in which the pattern is explicitly materialized, permanently (or temporarily) played by a single musician (or several playing in unison) as a varied (or fixed) ostinato. Examples of this type include *candomblé*, *afoxé*, and *maracatu de baque virado.* The phenomenon can be observed by means of a statistical study of the recurrence of note onsets of a single instrument. For example, in the *maracatu de baque virado* domain, I make a systematical transcription of all the variations of the *gonguê* bell of a *toada* (song) and a paradigmatic analysis (Example 7).[25] A rhythmic formula emerges from all the variations played by the musician. I state that this kind of study would lead to the same result regardless of the song one chooses from this corpus. In some communities, as in *maracatu nação* Leão Coroado, this rhythmic formula is a fixed ostinato.

19 Cardoso 2005.

20 Fonseca 2002, p. 13.

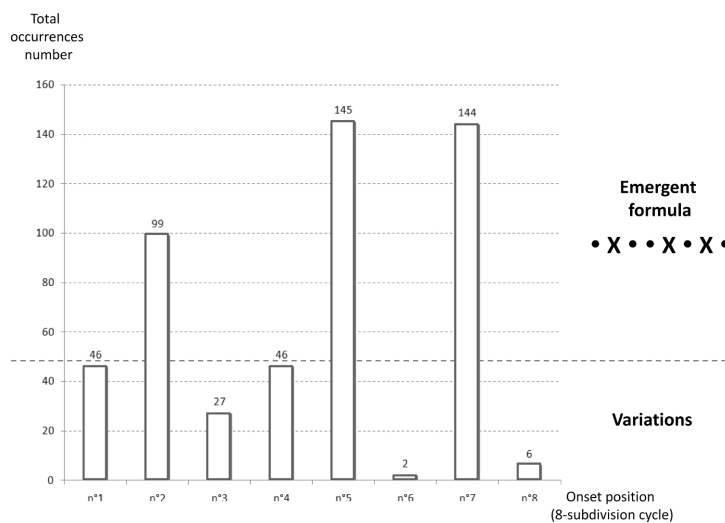21 Ibid, p. 15. Translation mine, from Brazilian Portuguese.

22 Toussaint 2002 referencing Chernoff 1979.

23 Kubik 1979, 1983, 1999; Chemillier 2005.

24 Among others: London 2004; Kvifte 2007; Polak et al. 2016.

25 Guillot 2008.

Example 7: Paradigmatic analysis of onguê bell in *Toque o onguê* (Maracatu Nação Estrela Brilhante do Recife, *maracatu de baque virado*, Pernambuco, 2002). The cycle is composed by eight subdivisions. Some onsets are more often played than others. The dash line splits the data and shows a very clear, emergent formula. Note: subdivision anisochrony is not visible on this diagram.

The second type of Afro-Brazilian time-line pattern is *implicit,* in which the patterns appear by emergence as a palimpsest induced by the polyrhythmic superposition of musical phrases (played by several musicians). Many forms of *samba* fit this category. See Example 8; here no instrument has the role of playing the time-line pattern, but it appears in song and *cuíca* phrases.

Like every classification model, this typology is not strict and allows for mixed forms. Moreover, even in a given music style, modalities can vary from one community to another. For example, in the music of Maracatu Leão Coroado (*maracatu de baque virado*), the bell pattern (*onguê*) is fixed, although it is varied in most other groups.

4.2 Polymeter

The idea that some African music would work polymetrically isn't new; for example, Richard Waterman defines the concept of polymeter as »the interplay of two or more metrical frameworks.«[26] It is also considered by Pressing as one

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26 Waterman 1952, p. 52.

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of the »characteristic devices« of Black-Atlantic rhythmic diaspora.[27] A similar idea is expressed as ›simultaneous multidimensionality‹ by Locke (2009). Based on these propositions and my own experience as a musician, I suggest that most, perhaps all, of Afro-Brazilian music is organized as a polymeter, with a relation of ›collaborative competition‹[28] among the meters. These meters share the same subdivisions and are synchronized with each other.

In order to give more substance to my assumptions, I have designed a circular diagram inspired by previous works[30] (see Example 9) to model the metric organization of a given piece of music. The circular diagram shows the complete polymeter, which can be divided into 8, 12, 16, 20 or 24 non-isochronous subdivisions (see the white dots on the circle; there are 16 in this example). The meters are represented as polygons. Each dot is weighted according to the metrical importance of the pulse, following the representation proposed by Fred Lerdahl and Ray Jackendoff – that is, from 1 to 3 aligned dots (representing weak and strong metrical weights, respectively).[31] When a pulse pertains to more than one meter, it has one weight per meter.

Polymeter can create a space for productive metric tension. Harald Krebs's concept of ›metrical dissonance‹ is useful here;[32] I claim that the interference between the metric structures produces a metric dissonance (the ›competition‹) with a kinesigenic power (resulting from the ›collaboration‹) which produces, at least, dance movement. This metric dissonance can be reinforced by melodic / harmonic cues located on specific pulses. It seems that in almost all songs in the style called *samba de raíz*, most important harmonic changes appear at the very end of what could be a four-beat measure (Example 8). I put forth the hypothesis that a similar type of metric dissonance appears in other kinds of Afro-Brazilian music. This statement will be discussed in further studies.

Pressing notes that Atlantic rhythms act as a kinetic framework in which the principle of polymetry is one of the above-mentioned ›characteristic devices‹. He states that »nearly all of these have at their heart the establishment of perceptual multiplicity or rivalry.«[33] This position could be strengthened by studies on

27 Pressing 2002.
28 This concept is explained later in this essay.
29 Sandroni 1997.
30 Toussaint 2002.
31 Lerdahl / Jackendoff 1983.
32 Krebs 1999.
33 Pressing 2002, p. 285.

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Example 8: Example of *samba* song showing the nested isochronous and non-isochronous meters, and the potential metric tensions (only one is showed) induced by the contradictory locations of metric keypoints. (The upper part of the figure shows an excerpt of *Onde esta a honestidade* from Sandroni[29]; the lower part shows examples of standard patterns played by typical instruments).

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Example 9: Metric model proposal for many kinds of *samba*. Left: each meter and its Western-type score equivalent. Right: palimpsest of the meters presented on the left. As cyclic music, no ›first beat‹ is considered on a strict rhythmic plan. Nevertheless, in order to follow the Western standards for *samba* notation, the subdivision located at the top of each circle corresponds to the first 16th note of each score.

dance performance. Victor Kofi Agawu recalls the importance of integrating African dancers' movements into the musical analysis.[34] Luiz Naveda shows how isochronous meter is expressed in performances of *samba no pé*.[35] Moreover, Roda Nina Graeff notes that »the movements of the different parts of the body are able to represent simultaneously and alternately the elementary pulses, the beats, the time-line pattern and the improvisation.«[36] In their descriptions of the *samba* dance, Naveda and Marc Leman[37] use the expression ›polymetric lines‹

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34 Agawu 2006.

35 For instance, *samba* in feet (Naveda 2011).

36 Graeff 2014, p. 19; translation mine.

37 Naveda / Leman 2009.

from Africanist literature and suggest a ›polymetric engagement‹ of the dancer. This idea could be reinforced by the promising concept of ›polycentrism‹,[38] born in the field of African and Western contemporary dances in order to describe how some parts of the body can move independently from other parts.

Thus, I put forth the hypothesis that, in (probably) all forms of Afro-Brazilian music, the musician makes dynamic inferences based on a compound temporal reference framework, like a ›dynamic polysynchronization‹ (even if this expression is not entirely satisfying). This statement will need to be verified through future experiments. Indeed, for the skeptics of the existence of polymetric organizations in some Afro-diasporic music,[39] the issue is the impossibility, for a musician, of synchronizing more than one metric stream at a time. According to this view, a musician can only shift from one stream to another. Agawu defines polymeter as the

> […] simultaneous use of more than one meter in an ensemble composition. Each functional component of the texture, be it an instrument or a group, is said to expose a distinct rhythmic pattern within its own metrical frame, apparently without any obvious regard for a larger coordinating mechanism. Constituent meters do not collapse into each other or into a larger meter, but persist into the background, creating a kind of metric dissonance or metric polyphony. Philosophically, polymeter indexes coexistence, not (necessarily) cooperation.[40]

Agawu's definition sounds like a dead-end for a potential application to Afro-Brazilian music. However, future research will likely demonstrate ways in which Agawu's arguments could be countered.

4.3 Contrametricity

In discussing West African rhythms, Magill and Pressing note that »time lines or bell patterns betray asymmetric construction and sound syncopated to Western ears.«[41] The term ›syncopated‹ is often taken as a synonym for ›contrametric‹. The terms ›commetric‹ and ›contrametric‹ have generally been used by following the definition proposed by Mieczyslaw Kolinski,[42] but without referring to the author's entire analysis. For his part, Simha Arom describes ›contrametrici-

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38 Günther 1969; Welsh-Ashante 2001.
39 For instance, Kolinski 1973; Agawu 2003; London 2004.
40 Agawu 2003, p. 79.
41 Magill / Pressing 1997.
42 Kolinski 1973.

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ty‹ (without any reference to Kolinski) as follows: »the relationship of rhythmic figure to the pulsation is *contrametric* when accents, changes of tone colour, of (failing these) attacks occur *predominantly on the offbeat*.«[43]

Arom admits only one kind of ›pulsation‹, defined as »the isochronous, neutral, constant, intrinsic reference unit which determines tempo.«[44] Indeed, while numerous scholars use the definitions of commetric and contrametric terms in reference to only the Western metric system, Kolinski quite rightly notes that »with regard to the widely distributed pattern 3+3+2 it is important to determine in each situation whether we deal with a contrametric organization within a regular metric framework or with a commetric organization within an irregular metric framework.«[45]

Here it seems very clear that the expression »irregular metric framework« could be advantageously replaced today by the expression »non-isochronous meter«. Thus, it is important that any use of the term ›contrametricity‹ is accompanied by a precise definition of its reference, that is, the meter in relation to which a given rhythmic accent or pattern appears congruent (commetric) or noncongruent (contrametric). If my hypothesis about polymetricity is assumed, then contrametricity must be considered in relation to each meter.

As Justin London (in his comments on this paper) suggests, it would be interesting to abandon such a binary dichotomy and to imagine a »degree of alignment between the phenomenal rhythm (with its attendant phenomenal stresses and articulations) and our mental/endogenous metric entrainment (which has its own structural regularities).«[46] So, if meter is partially a question of culture, a classical rhythm of *samba* could be perceived as mainly syncopated by foreigners, but not really syncopated by *samba* musicians themselves. Nevertheless, it must be kept in mind that these categories are etic projections and, as far as I know, are not used in an emic context: I have never heard any Afro-Brazilian musician using any of the musicological terms used in this paper, not even ›syncopation‹.

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43 Arom 1985, p. 242. Terms in italics from Arom.

44 Ibid, p. 202.

45 Kolinski 1973, p. 500. Before him, Sachs (1953) said approximately the same thing. Cf. Kvifte 2007, p. 67.

46 Cf. London's essay in this volume, p. **YYY.**

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5. Conclusion

To conclude, I have proposed two categories of anisochrony that operate simultaneously in much, perhaps all, Afro-Brazilian music. The first one operates at the level of pulse subdivision. Its presence seems to be attested since at least the beginning of 20th century. Although there is a generic structure characteristic of Afro-Brazilian ›swing‹ timing at large, local communities and regional styles show a diversity of details in their typical specific timing practices. Finding common traits in the hope of establishing stylistic taxonomies remains a real challenge.

The second category of anisochrony is located at the beat level, where it forms a real asymmetric (explicit or implicit) structure of entrainment, thus a structure of musical synchronization. In the musical traditions very briefly discussed in this paper, I propose its coexistence with a (explicit or implicit) structure of isochronous beats forming a polymeter. I put forth the hypothesis that such a polymeter is at the same time a kind of ›kinetic space‹ of intrinsic metric tension with kinesigenic properties and an audial space in which the musician can do a weighted, dynamic polysynchronization. The relations between these two kinds of anisochrony seem not to have been studied so far. This is a desideratum for future research.

Testing the set of hypotheses put forth in this presentation would require an extensive effort of empirical research.[47] This would call for a combination of methods that goes beyond what has been applied so far – namely ethnography, participant observation, conventional music analysis, and computer-aided measurement of performance timings. Beyond this, we might also need cleverly designed experimental investigations, accomplished with a sensitivity to cultural issues, in order to better understand the perceptual and cognitive aspects of music – that is, aspects which otherwise are hard to come by for musicology and music theory.

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47 Nevertheless, even if all my hypotheses were verified, the problem would not be totally solved. For example, the majority of *samba* musicians that I met declare that *samba* is two-beat music. The rare transcriptions seem to confirm this point of view, by presenting the *samba* as though it can be heard as a hypermeter constituted by two 8-subdivision cycles, written as a 2/4 isochronous meter. This could be justified or explained by the co-presence of a strong beat occurring every two beats and of an 8-basic-pulses anisochronous meter. But, thanks to Sandroni, we know that most forms of *samba* since the end of 1930s are organized on a 16-pulses timeline pattern, which we call anisochronous meter. So, *samba* musicians think ›in two‹ music based on a four-beats cycle! Such a mystery could bear on the question of how these musicians focus their musical attention.

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